[2345/108]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s)	:	Hans Wilfried Peter KOOPS
Serial No.	:	09/462,283
Filed	:	March 29, 2000
For	:	METHOD FOR PRODUCING ACTIVE OR PASSIVE COMPONENTS ON A POLYMER BASIS FOR INTEGRATED OPTICAL DEVICES
Art Unit	:	1765
Examiner	:	S. Ahmed

Commissioner of Patents
P.O. Box 1450
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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on

Date: Aug. 21, 2003

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Linda M. Study (Reg. No. 47,084)

AMENDMENT

SIR:

In response to the Office Action having mailing date February 5, 2003, please reconsider the above-identified application based on the following.

IN THE CLAIMS:

Please amend claim 7 without prejudice as follows:

7. (Twice amended) A process for fabricating active and passive polymer-based components for use in integrated optics according to a principle based on one of a gas-phase diffusion and a liquid-phase diffusion, comprising the steps of:

depositing onto an optoelectronic component at least one patternable polymer resist layer that is highly sensitive and that effects an intense polymerization when exposed;

producing an etching mask by exposing defined regions of the at least one patternable polymer resist layer corresponding to a later component;

transferring a geometry of the etching mask through a high-grade anisotropic deep etching into unprotected regions of the at least one patternable polymer resist layer located

underneath the etching mask, wherein an etching agent is used that avoids attacking a silicon oxide of the etching mask, such that exposed regions of the at least one patternable polymer resist layer are ablated in a vertical direction, and side surfaces of regions protected by the etching mask are uncovered; and

filling unexposed regions of the at least one patternable resist layer with organometallic compounds arranged in a monomer form, the organometallic compounds being suitable for filling an already existing pattern of the at least one patternable polymer resist layer and for breaking up and repatterning the already existing pattern, wherein an optical property of the optoelectronic component is selectively changeable as a function of a type of the monomeric organometallic compounds and as a function of a temperature and an application time, the filling of the unexposed regions of the at least one patternable resist layer occurring, through one of the gas-phase diffusion and the liquid-phase diffusion and with an application of heat, from a surface of the unexposed regions through the etching mask, and occurring from the side surfaces uncovered by the deep etching,

so that at least one of the active and the passive polymer-based components for use in integrated optics is fabricated.

REMARKS

Claims 7 to 14 are now pending.

Claim 7 has been amended. No new matter has been added. A version showing changes made to claim 7 is attached hereto.

Claims 7, 9 to 11 and 13 were rejected under 35 U.S.C. § 103(a) as unpatentable over Brenner et al. ("Deep Proton Irradiation of PMMA for a 3D Integration of Micro-Optical Components", Integrated Optics and Micro-Optics with Polymers, Germany, 1993) (the "Brenner reference") in view of Eguchi et al. ("Gradient Index Polymer Optical Waveguide Patterned by Ultraviolet Irradiation," Japanese Journal of Applied Physics, Japan, 1989) (the "Eguchi reference").

The Brenner reference purportedly concerns a three-dimensional optics system employing polymethyl methacrylate (PMMA) as a substrate material and focuses on an integration method for passive microoptical components based on deep proton irradiation. (See Brenner reference, page 161). The Brenner reference does not describe or suggest filling the unexposed regions of the at least one patternable resist layer with organometallic compounds where the optoelectronic component is selectively changeable as a function of the

type of the monomeric organometallic compounds and as a function of temperature and application time, so that the process of the present application fabricates at least one of the active and the passive polymer-based components for use in integrated optics, as in amended claim 7. Further, the Brenner reference focuses on providing a three dimensional structure in which microlenses and microprisms can be integrated monolithically in a substrate and due to monolithic integration no alignment between the lenses and the prisms is required. (See Brenner reference, pages 160-162). Thus, the Brenner reference concerns a different purpose and does not describe or suggest, among other things, a process for fabrication using organometallic compounds, nor does it describe or suggest filling the unexposed regions of the at least one patternable resist layer with organometallic compounds where the optoelectronic component is selectively changeable as a function of the type of the monomeric organometallic compounds *and* as a function of temperature and application time, as in claim 7 of the present application. Further, the Office Action admits that the "Brenner reference does not teach using an organometallic compound" and that the Brenner reference "do[es] not explicitly teach that the optical property of the optoelectronic component is configured to be selectively changed as a function of a type of monomeric organometallic compound and as a function of a temperature and an application time."

The Eguchi reference does not cure the deficiencies of the Brenner reference. The Eguchi reference refers to fabricating gradient index polymer optical waveguides having patterns, simultaneous formation of the core and cladding, and relatively high refractive index differences so that any excess loss caused by difference in core shapes on connection to optical fibers is reduced. The Eguchi reference is focused on providing a fabrication technique for optical waveguides where the monomers with a lower refractive index are diffused into a gel containing barium ion patterned by uv irradiation and then the diffusion profile is fixed by thermal polymerization. In the Eguchi reference, a gel substrate was prepared by thermally curing a transparent monomer composite containing a radical initiator and a photoinitiator at 60 degrees Celsius for 100 minutes. The desired pattern for the waveguide is formed through a mask by uv irradiation of the gel substrate with a 100 watt high-pressure mercury vapor lamp. The mask is apparently composed of two straight lines and the rest of the surface is covered with chromium. The gel substrate is immersed at room temperature in a solution of acrylic acid and other components including a radical inhibitor. The gel substrate is then attached between two transparent plates and thermally cured at 70 degrees Celsius for 10 hours, providing a larger refractive index difference between the

outside and the center due to the irradiation.

Indeed, the Eguchi reference is directed to a completely different fabrication technique and purpose than the Brenner reference; and any purported use of an organometallic compound in the Eguchi reference cannot lend itself to the leap that there is any motivation to combine the Eguchi and Brenner references together. And, if they were combinable (it is respectfully submitted that they are not), the Eguchi and Brenner references still do not teach or suggest all of the claimed features of amended claim 7 respectfully submitted above.

Accordingly, it is respectfully submitted that amended claim 7 is allowable and Applicants respectfully request withdrawal of the rejection of claim 7 under 35 U.S.C. § 103(a) over the Brenner reference in view of the Eguchi reference.

Since claims 9 to 11 and 13 depend from amended claim 7, those claim are allowable for at least the same reasons as for claim 7, and Applicants respectfully request withdrawal of the rejection of claims 9 to 11 and 13 under 35 U.S.C. § 103(a) over the Brenner reference in view of the Eguchi reference.

Claim 8 was rejected under 35 U.S.C. § 103(a) as unpatentable over the Brenner reference in view of the Eguchi reference and further in view of U.S. Patent No. 4,704,347 to Vollenbroek et al. (the "Vollenbroek reference").

Since claim 8 depends from amended claim 7, claim 8 is allowable at least for the same reasons as claim 7 over the Brenner reference in view of the Eguchi reference.

The Vollenbroek reference does not cure the deficiencies of the Brenner reference and the Eguchi reference, alone or in combination. The Vollenbroek reference refers to a method for manufacturing a semiconductor device by applying a photosensitive lacquer layer to a substrate. During a first irradiation, a top layer of the substrate is locally discolored, the discolored portion being used as a mask during a second irradiation, thus avoiding wet development of the top layer. While novolak is mentioned for use in the process described in the Vollenbroek reference, the Vollenbroek reference does not describe or suggest, among other things, a process for fabrication using organometallic compounds, nor does it describe or suggest filling the unexposed regions of the at least one patternable resist layer with organometallic compounds where the optoelectronic component is selectively changeable as a function of the type of the monomeric organometallic compounds *and* as a function of temperature and application time, as claimed in claim 7 (or claim 8) of the present application.

Accordingly, it is respectfully submitted that claim 8 is allowable and Applicants

respectfully request withdrawal of the rejection of claim 8 under 35 U.S.C. § 103(a) over the Brenner reference in view of the Eguchi reference and further in view of the Vollenbroek reference.

Claim 12 was rejected under 35 U.S.C. § 103(a) as unpatentable over the Brenner reference in view of the Eguchi reference and further in view of U.S. Patent No. 5,943,464 to Khodja (the "Khodja reference").

Since claim 12 depends from amended claim 7, claim 12 is allowable at least for the same reasons as claim 7 over the Brenner reference in view of the Eguchi reference.

The Khodja reference does not cure the deficiencies of the Brenner reference and the Eguchi reference, alone or in combination. The Khodja reference refers to a nonlinear optical device having a waveguide adjacent to a substrate, the waveguide being "preferably" formed of a polymer or other matrix material that contains chromophores having different dipole moment directions when in respective different energy states. The Khodja reference further refers to the chromophores being poled to have alternating first and second dipole moment directions thereby defining corresponding alternately poled waveguide portions. The Khodja reference does not describe or suggest, among other things, a process for fabrication using organometallic compounds, nor does it describe or suggest filling the unexposed regions of the at least one patternable resist layer with organometallic compounds where the optoelectronic component is selectively changeable as a function of the type of the monomeric organometallic compounds *and* as a function of temperature and application time, as claimed in claim 7 (or claim 12) of the present application.

Accordingly, it is respectfully submitted that claim 12 is allowable and Applicants respectfully request withdrawal of the rejection of claim 12 under 35 U.S.C. § 103(a) over the Brenner reference in view of the Eguchi reference and further in view of the Khodja reference.

Claim 14 was rejected under 35 U.S.C. § 103(a) as unpatentable over the Brenner reference in view of the Eguchi reference and further in view of Japanese Patent Application No. 402140749A to Akira (the "Akira reference").

Since claim 14 depends from amended claim 7, claim 14 is allowable at least for the same reasons as claim 7 over the Brenner reference in view of the Eguchi reference.

The Akira reference does not cure the deficiencies of the Brenner reference and the Eguchi reference, alone or in combination. The Akira reference refers to forming a pattern having prescribed dimensions by dry development with oxygen plasma by selectively

removing a silylated layer formed on the entire surface of a resist with a high energy pulse. The Akira reference further refers to providing a semiconductor substrate coated with a resist which is irradiated with far UV in an atmosphere of Si-contg. gas to form a silylated layer on the entire surface of the resist; the layer is pulsatively irradiated with high energy beams through a photomask. The Akira reference further refers to using reactive ion etching with oxygen plasma, layer being converted into a dry etching resistant film. The Akira reference does not describe or suggest, among other things, a process for fabrication using organometallic compounds, nor does it describe or suggest filling the unexposed regions of the at least one patternable resist layer with organometallic compounds where the optoelectronic component is selectively changeable as a function of the type of the monomeric organometallic compounds *and* as a function of temperature and application time, as claimed in claim 7 (or claim 14) of the present application.

Accordingly, it is respectfully submitted that claim 14 is allowable and Applicants respectfully request withdrawal of the rejection of claim 14 under 35 U.S.C. § 103(a) over the Brenner reference in view of the Eguchi reference and further in view of the Akira reference.

Moreover, to reject a claim as obvious under 35 U.S.C. § 103(a), the prior art must describe or suggest each claim element and it must also provide a motivation or suggestion for modifying the elements in the manner contemplated by the claim. (See Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed. Cir. 1990), cert. denied, 111 S. Ct. 296 (1990); In re Bond, 910 F.2d 831, 834 (Fed. Cir. 1990)). The cases of In re Fine, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988), and In re Jones, 21 U.S.P.Q.2d 1941 (Fed. Cir. 1992), also make plain that a subjective "obvious to try" standard is not proper.

More recently, the Federal Circuit in the case of In re Kotzab has made plain that even if a claim concerns a **"technologically simple concept"** -- which is not even the case here, there still must be some finding as to the "specific understanding or principle within the knowledge of a skilled artisan" that would motivate a person having no knowledge of the claimed subject matter to "make the combination in the manner claimed", stating that:

> In this case, the Examiner and the Board fell into the hindsight trap. The idea of a single sensor controlling multiple valves, as opposed to multiple sensors controlling multiple valves, **is a technologically simple concept**. *With this simple concept in mind, the Patent and Trademark Office found prior art statements that in the abstract appeared to suggest the claimed limitation.* **But, there was no finding as to the specific understanding or principle within the knowledge of a**

> **skilled artisan that would have motivated one with no knowledge of Kotzab's invention to make the combination in the manner claimed.** In light of our holding of the absence of a motivation to combine the teachings in Evans, we conclude that the Board did not make out a proper *prima facie* case of obviousness in rejecting [the] claims . . . under 35 U.S.C. Section 103(a) over Evans.

(See In re Kotzab, 55 U.S.P.Q.2d 1313, 1318 (Federal Circuit 2000) (italics added)). Here again, there have been no such findings.

It is therefore respectfully submitted that the claims rejected as obvious are allowable over the references relied upon.

CONCLUSION

In view of all of the above, it is believed that any rejections have been obviated, and that claims 7 to 14 are allowable. It is therefore respectfully requested that the objection and rejection be withdrawn, and that the present application issue as early as possible.

If for any reason the Examiner believes that contact with Applicant's attorney would advance the prosecution of this application, he or she is invited to contact the undersigned at the number given below.

Respectfully submitted,

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Dated: Aug. 5, 2003

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VERSION SHOWING CHANGES MADE TO CLAIM(S)
U.S. Application Serial No. 09/462,283
Attorney Docket No. 2345/108

IN THE CLAIMS:

Please amend claim 7 without prejudice as follows:

7. (Twice amended) A process for fabricating active and passive polymer-based components for use in integrated optics according to a principle based on one of a gas-phase diffusion and a liquid-phase diffusion, comprising the steps of:

depositing onto an optoelectronic component at least one patternable polymer resist layer that is highly sensitive and that effects an intense polymerization when exposed;

producing an etching mask by exposing defined regions of the at least one patternable polymer resist layer corresponding to a later component;

transferring a geometry of the etching mask through a high-grade anisotropic deep etching into unprotected regions of the at least one patternable polymer resist layer located underneath the etching mask, wherein an etching agent is used that avoids attacking a silicon oxide of the etching mask, such that exposed regions of the at least one patternable polymer resist layer are ablated in a vertical direction, and side surfaces of regions protected by the etching mask are uncovered; and

filling unexposed regions of the at least one patternable resist layer with organometallic compounds arranged in a monomer form, the organometallic compounds being suitable for filling an already existing pattern of the at least one patternable polymer resist layer and for breaking up and repatterning the already existing pattern, wherein an optical property of the optoelectronic component is [configured to be] selectively [changed] changeable as a function of a type of the monomeric organometallic compounds and as a function of a temperature and an application time, the filling of the unexposed regions of the at least one patternable resist layer occurring, through one of the gas-phase diffusion and the liquid-phase diffusion and with an application of heat, from a surface of the unexposed regions through the etching mask, and occurring from the side surfaces uncovered by the deep etching,

so that at least one of the active and the passive polymer-based components for use in integrated optics is fabricated.